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The Scutacarid Mites of Japan

XIII. Two New *Archidispus* Phoretic on Carabid Beetles Mainly Belonging to the Pterostichini and Harpalini

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Abstract Two new species of scutacarid mites, *Archidispus chujoi* and *A. tonegawanus* spp. nov. are described from Japan based on phoretomorphic females found on the cervical membrane between head and prothorax, or intersegmental membrane between pro- and mesothorax of carabid beetles mainly belonging to the tribes Pterostichini and Harpalini.

Thirty-seven named species of the genus *Archidispus* have so far been recorded from Japan. All of them are known to be phoretic on carabid beetles in a broad sense. Two more new species of the genus are described in this paper on the bases of phoretomorphic females found on the cervical membrane between head and prothorax, or intersegmental membrane between pro- and mesothorax of 18 Japanese carabid species mainly belonging to the tribes Pterostichini and Harpalini.

The terminology of the body structures and the setal notation mostly follow those of Lindquist (1986). All measurements are given in micrometers (μm). The RCC3 index (ratio of length (or distance) of any structure to the mutual distance of anterior coxal condyles III×100) (Kurosa, 1989) is used for the convenience of description. The measurements of leg lengths and mutual distance of anterior coxal condyles III used herein are the same as those explained in the last paper of mine (Kurosa, 2003).

The present paper is dedicated to the memory of the late Dr. Michio Chûjô, who passed away in June 2004. I wish to express my gratitude to the late Mr. Yoshio Yano, Messrs. Fumitaka Ikeda (Fukurono-shi), Takashi Okumura (Yokohama-shi), Sei Sakurai (Niitsu-shi), Masaaki Satou (Takamatsu-shi), Masaharu Takaba (Kanazawa-shi), Takanobu Takahashi (Saga-shi) and my son, Yoshiro, for supplying with the material used in this study.

Archidispus chujoi Kurosa, sp. nov.

(Figs. 1–3, 5)

Archidispus sp. No. 16: Kurosa, 1977, p. 394, fig. V–C; 2000, p. 915, fig. 14.

Phoretomorphic female. Body length (length of idiosoma) 162–215; body width

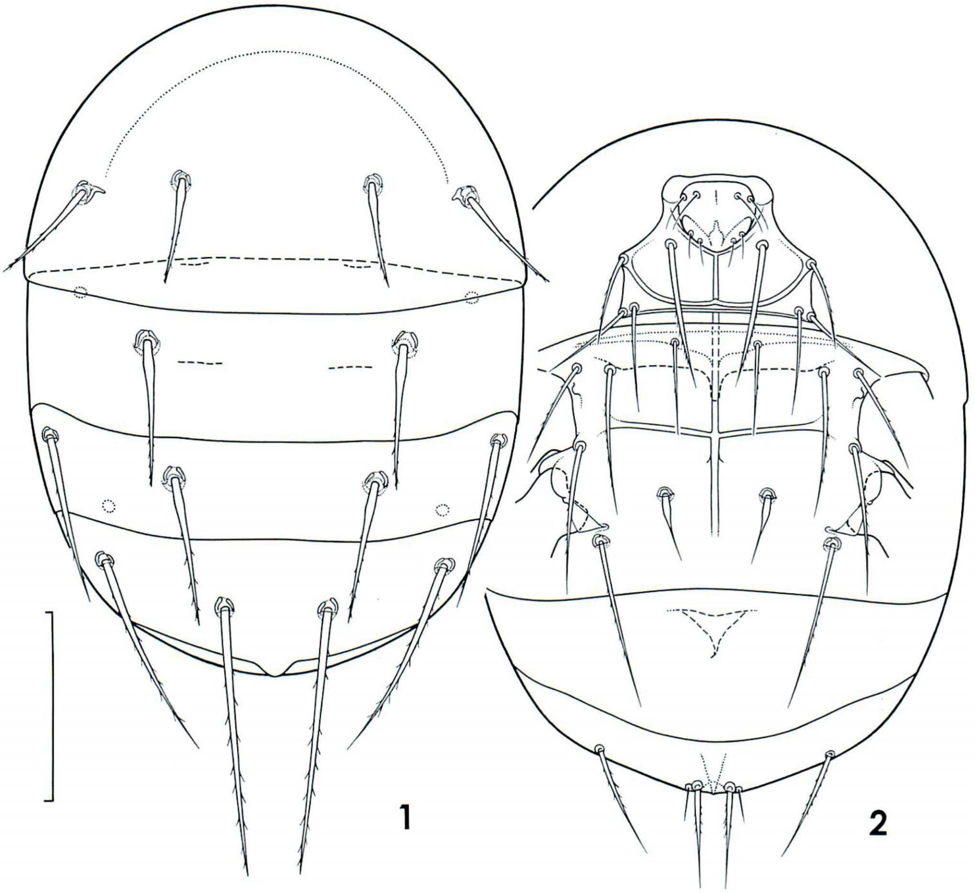
(width of opisthosomal plate C) 137–170; mutual distance of anterior coxal condyles 79–92 (mean 85.7±S.D. 3.05, n=27). Gnathosomal capsule short for the width.

Dorsum (Fig. 1). Free margin of plate C medium in width, with radial striations faintly visible. Dorsal setae of opisthosoma moderately long except for h_1, with barbations; c_1, d and f arranged in two subparallel longitudinal lines, weakly swollen in basal 1/4 or thereabouts, usually having somewhat strangulated appearance, not fine distally; c_1 inserted slightly anterior to, and (usually) slightly shorter than c_2, which is similar in shape to c_1; marginal thickening of alveolus for c_2 usually with a very short (2.5–4.5 long), indistinct, posteromesal protrusion; ratio of mutual distance d–d/f–f 1.16–1.35; h_1 1.74–1.97 times as long as f. The order in length of dorsal opisthosomal setae: $h_1>h_2>e>f\fallingdotseq d>c_2\geqq c_1$.

Venter (Figs. 2, 5). Apodemes well developed; apodeme 2 smoothly arcuate (the curvature is often weak in medial 2/5), sometimes conjointly forming a very obtuse reentrant angle medially; secondary transverse apodeme (Cross, 1965) distinct, weakly postcurved or (rarely) almost straight, crossing prosternal apodeme at a level slightly posterior to posteriormost point of apodeme 2; apodeme 3 pronounced; apodeme 4 usually rectilinear, weakly proclinate or (rarely) horizontal, laterally reaching cuticular thickening by coxal foramen III. Posterior genital sclerite rather small. Coxal setae simply setiform except for *1a* and *4a*, faintly barbed except for *4a*; *1a* inserted slightly anterior to the level of posteriormost point of camerostome (=gnathosomal foramen of Cross, 1965), nearly of the same thickness throughout except for distal 1/5 or thereabouts; *2a* close by, and slightly anterior to *2c*; *3a* fully reaching apodeme 4; *3b* some distance posterior to *3a*, considerably apart from poststernal apodeme; ratio of mutual distance *3b–3b*/*3a–3a* 2.51–2.73; *3c* roughly on the same level as *3b*; *4a* a little closer to level of *4b* than to apodeme 4, distinctly thickened and (sometimes) slightly incurved in basal half, the transition from thick to thin portion rather abrupt; *4b* inserted close to posterior end of coxal foramen IV, slender, never thickened basally, usually weakly incurved or almost straight. Pseudanal setae ps_1 and ps_3 moderately long, weakly barbed; ps_3 slightly longer than ps_1; ps_2 about 1/3 the length of ps_1.

Legs. Generally moderate in length and thickness. Leg I: femoral seta d foliate; tibiotarsus not stout; solenidion φ_1 subclavate; ω_1 finger-shaped; φ_2 and ω_2 uniformly thin; the order in length of solenidia in some examples: ω_2 (16–18)$\fallingdotseq\varphi_2$ (15–18)$>\omega_1$ (8–11)$\geqq\varphi_1$ (8–10). Legs II and III: tibial solenidion φ rodlike, 8–10 in length; tarsal solenidion ω subfusiform, 9–11 in length; anterior claw nearly twice the size of posterior one; empodium medium-sized. Leg IV (Fig. 3): tarsus moderately elongated; proximal portion of tarsus usually rather strongly widened from base to insertions of setae pv' and tc'; pretarsus rather well elongated; length ratio of pretarsus to tarsus 0.60–0.65; femoral and tibial setae d not much different in length from each other and from tibial seta l', nearly always a little longer than tarsus, not fine distally, with bluntly pointed apex; tibial solenidion φ 11–14 in length; tarsal seta pl'' inserted close to base of tc'; claws small; empodium small, long-stalked.

RCC3 indices (n=10). Body length 207–238, body width 162–176. Length and



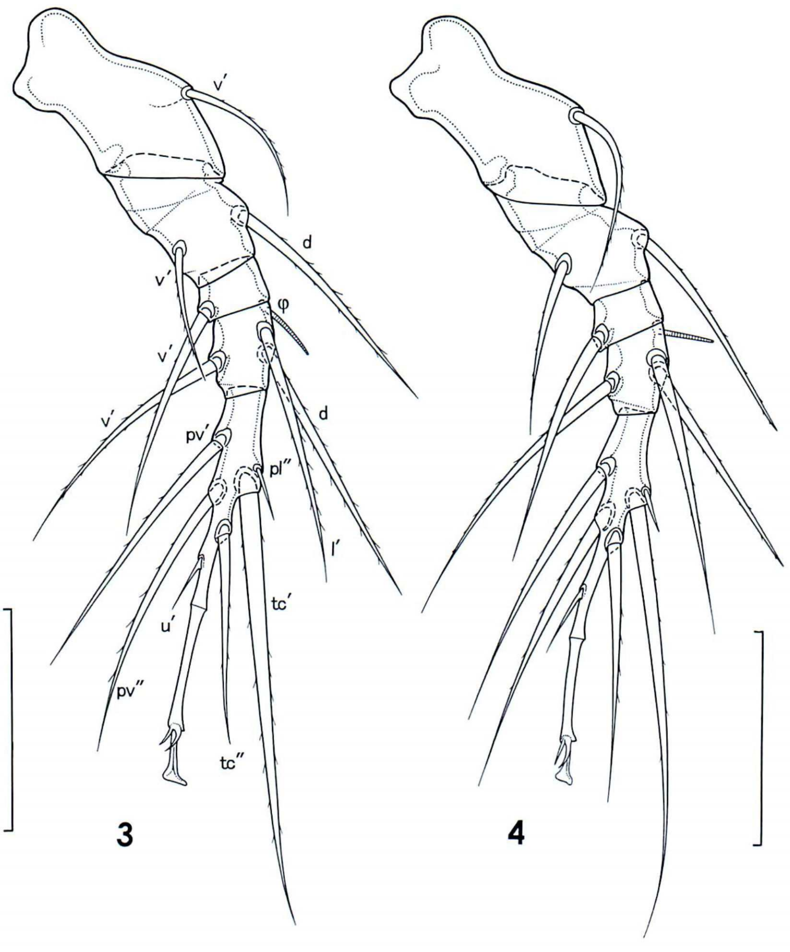
Figs. 1–2. *Archidispus chujoi* KUROSA, sp. nov., phoretomorphic female; 1, dorsal aspect; 2, ventral aspect. Slightly modified from KUROSA, 2000. Scale: 50 μm.

mutual distance (in parentheses) of opisthosomal and coxal setae: c_1 33–39 (63–67), c_2 39–43 (129–137), *d* 42–49 (81–90), *e* 58–64 (146–155), *f* 44–51 (67–76), h_1 82–94 (33–38), h_2 66–78 (106–118), ps_1 30–37 (12–14), ps_2 10–13 (18–20), ps_3 34–42 (79–86), *1a* 42–51 (31–35), *1c* 30–37 (62–66), *2a* 32–39 (55–59), *2c* 30–39 (64–67), *3a* 31–36 (26–29), *3b* 44–52 (72–77), *3c* 33–40 (96–99), *4a* 20–24 (34–37), *4b* 51–57 (77–80), *4c* 51–56 (92–94). Length of legs (including some segments and some setae of leg IV): leg I 57–70, leg II 90–99, leg III 112–122, leg IV 159–167 (tarsus 44–48, pretarsus 25–29, Fe-*d* 52–61, Fe-*v′* 30–35, Ti-*d* 54–67, Ti-*l′* 55–67, Ta-*tc′* 96–112).

Non-phoretomorphic female, male and larva. Unknown.

Host. All the specimens examined, about 170 phoretomorphic females in total, were collected from the following carabid beetles belonging to four tribes:

Tribe Bembidiini — *Bembidion* (*Notaphocampa*) *niloticum batesi* PUTZEYS; tribe



Figs. 3–4. *Archidispus* spp. nov., phoretomorphic female, left leg IV, ventral aspect. —— 3, *A. chujoi*1); 4, *A. tonegawanus*. Scales: 50 μm.

Pterostichini — *Chlaeminus annamensis* TSCHITSCHÉRINE, *Pterostichus* (*Poecilus*) *planicollis* (MOTSCHULSKY), *P.* (*Rhagadus*) *microcephalus* (MOTSCHULSKY), *P.* (*Eurythoracana*) *haptoderoides japanensis* LUTSHNIK; tribe Platynini — *Platynus* (*Agonum*) *daimio* (BATES), *Colpodes* (*Eucolpodes*) *japonicus* (MOTSCHULSKY); tribe Harpalini — *Anisodactylus punctatipennis* MORAWITZ, *Harpalus* (*Pseudoophonus*) *jureceki* (JEDLIČKA), *Stenolophus* (*Stenolophus*) *connotatus* BATES, *S.* (*S.*) *iridicolor* REDTENBACHER, *S.* (*S.*) *kurosai* TANAKA, *S.* (*Egadroma*) *quinquepustulatus* (WIEDEMANN), *S.* (*E.*) *difficilis* (HOPE) and *Anoplogenius cyanescens* (HOPE).

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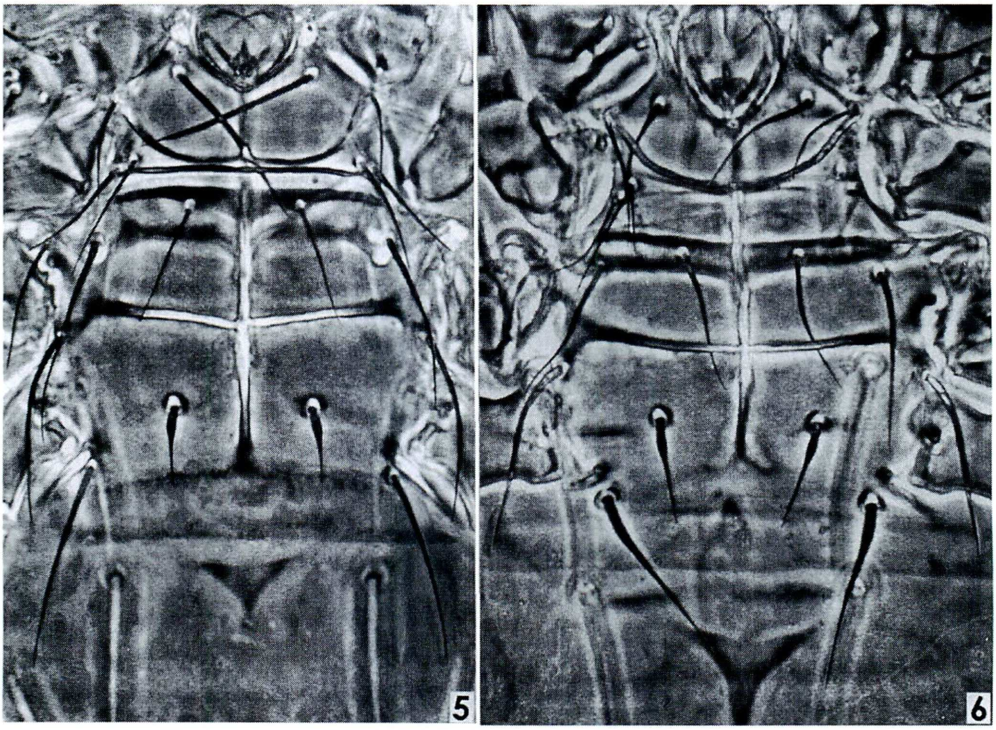
1) Proximal portion of tarsus is usually more strongly widened from the base to the insertions of setae *tc′* and *pv′* than illustrated.

The phoretomorphic females were found exclusively attached to the cervical membrane between head and prothorax of the host beetles, with the exception of two specimens from the intersegmental membrane between pro- and mesothrax of *S. iridicolor* and *Ano. cyanescens*. The largest number of mites per host was 11 (on *Ano. cyanescens*).

The female mites of the new species were frequently found in coexistence with those of one or two other congeneric species such as *A. conspicuus* Kurosa, *A. foliatus* Kurosa, *A. fusiformis* Kurosa, *A. insolitus* (Kurosa), *A. longicaudatus* Kurosa, *A. masatakai* Kurosa, *A. papillosus* Kurosa, *A. proximus* Kurosa and *A. rostratus* Kurosa, on the cervical membrane of each host beetle.

Type material. Holotype ♀ (Kurosa 20235-1): Torami, Ichinomiya-machi, Chiba Pref., Honshu, Japan, ex *Anoplogenius cyanescens* (Hope), 2–IX–1975, K. Kurosa leg. Paratypes: [Honshu] 22♀♀, same data as holotype; 3♀♀, same data as holotype but 27–VII–1976; 1♀, same data as the preceding but ex *Pl. daimio*; 3♀♀, same data as holotype but ex *S. kurosai*; 5♀♀, Kita-Kogane, Matsudo-shi, Chiba Pref., ex *Ano. cyanescens*, 1–XII–1975, T. Okumura; 1♀, Sekiyado-machi, Higashi-Katsushika-gun, Chiba Pref., ex *S. iridicolor*, 8–XI–1971, K. Kurosa; 1♀, Riv. Tone-gawa by Toride-shi, Ibaraki Pref., ex *Pt. encopoleus,* 17–IX–1972, K. Kurosa; 1♀, same data as the preceding but ex *Pt. microcephalus*; 3♀♀, same data as the preceding but ex *Pt. h. japanensis*; 1♀, same data as the preceding but ex *Ani. punctatipennis*; 3♀♀, same data as the preceding but ex *Ano. cyanescens*; 2♀♀, same data as the preceding but ex *S. connotatus*; 17♀♀, same data as the preceding but ex *S. difficilis*; 1♀, same data as the preceding but 2–IX–1971; 1♀, Misono, Itabashi-ku, Tokyo, ex *Ano. cyanescens*, 5–IX–1967, K. Kurosa; 2♀♀, Toyoda-machi, Iwata-gun, Shizuoka Pref., ex *S. difficilis*, 1~9–VIII–1981, F. Ikeda; 11♀♀, Niitsu-shi, Niigata Pref., ex *S. iridicolor*, 3–VII–1971, S. Sakurai; 1♀, Ibaraki-shi, Osaka Pref., ex *B. n. batesi*, 3–III–1940, Y. Yano; [Shikoku] 1♀, Matsushima-chô, Takamatsu-shi, Kagawa Pref., ex *S. difficilis*, 7–VII–1974, M. Satou; 2♀♀, Yashima, Takamatsu-shi, Kagawa Pref., ex *Ano. cyanescens*, 6–V–1974, M. Satou; 1♀, Oda-chô, Kami-Ukena-gun, Ehime Pref., ex *H. jureceki*, 11–IX–1988, Y. Kurosa; [Kyushu] 1♀, Mae-shima Is., Matsushima-chô, Kumamoto Pref., ex *S. difficilis*, 5–VIII–1975, Y. Kurosa; [Ryukyus] 1♀, Nago-shi, Okinawa-hontô Is., Okinawa Pref., ex *S. qinquepustulatus*, 4–V–1973, K. Kurosa; 1♀, Maesato, Ishigaki-jima Is., Okinawa Pref., ex *S. quinquepustulatus*, 1–X–1975, T. Takahashi; 6♀♀, Mt. Banna-dake, Ishigaki-jima Is., Okinawa Pref., ex *S. quinquepustulatus*, 30–IV–1973, K. Kurosa; 2♀♀, Sonai, Yonaguni-jima Is., Okinawa Pref., ex *Ch. annamensis*, 7–V–1979, Y. Kurosa.

Further specimens examined. In addition to about 70 specimens with the same data as the type series, the following were examined: [Honshu] 1♀, Narimasu, Itabashi-ku, Tokyo, ex *Co. japonicus*, 1–X–1958, K. Kurosa; 1♀, same locality and collector as the preceding, ex *S. difficilis*, 22–VI–1958; 1♀, same locality and collector as the preceding, ex *S. quinquepustulatus*, 30–VII–1958; 2♀♀, Wakamatsu, Kanazawa-shi, Ishikawa Pref., ex *S. iridicolor*, 29–VII–1970, M. Takaba; 1♀, Uenoshiba, Sakai-



Figs. 5–6. Photomicrographs of *Archidispus* spp. nov., phoretomorphic female, gnathosoma, coxisternal plates and a part of opisthosomal venter. —— 5. *A. chujoi*; 6. *A. tonegawanus*.

shi, Osaka Pref., ex *S. iridicolor*, 11–IV–1940, Y. YANO.

Type depository. The holotype is deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT), Japan. Several paratypes are distributed to the following museums or institutes: Institut für Zoologie, Universität Graz, Graz, Austria; Institute royal des Sciences naturelles de Belgique, Brussels, Belgium; Zoologisches Museum der Universität Hamburg, Germany; National Museum of Natural History, Budapest, Hungary; Nikita Botanical Gardens, Yalta, Ukraine; National Museum of Natural History, Washington, D. C., U. S. A. The remaining paratypes are now retained in my collection, but will be deposited in NSMT later.

Distribution. Japan (Honshu, Shikoku, Kyushu and Ryukyus).

Etymology. This new species is named in honor of the late Dr. Michio CHÛJÔ, who was one of the most eminent coleopterologists in our country and personally encouraged me in my entomological and acarological studies.

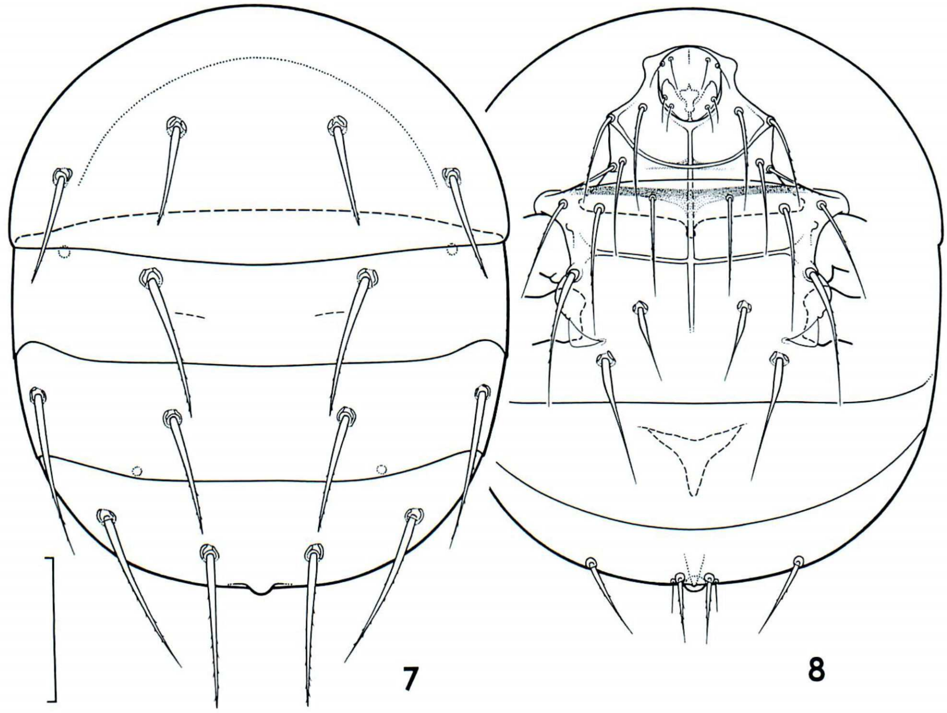
Remarks. The phoretomorphic female of this species is similar to those of *Archidispus crassiradix* KUROSA, 1989, and *A. kurosai* MAHUNKA et RACK, 1990 (replacement name for *A. similis* KUROSA, 1989), both from Japan, but can readily be distinguished from them by the following respects: 1) coxal seta *4a* is inserted somewhat closer to level of *4b* than to apodeme 4 (*4a* is much closer to apodeme 4 than to level of *4b* in the other two species); 2) coxal seta *4b* is much thinner, never thickened basally; 3) length ratio of pretarsus to tarsus of leg IV is clearly different (0.61–0.65 in *A. chujoi*, 0.41–0.49 in *A. crassiradix*, 0.41–0.48 in *A. kurosai*). The new species is considered a close relative of the above two species and three other allied species, *A. riparius* Kurosa, 1990, *A. proximus* Kurosa, 1990 and *A. ohtanii* Kurosa, 1990, all from Japan.

Archidispus tonegawanus Kurosa sp. nov.

(Figs. 4, 6, 7–8)

Phoretomorphic female. Body length (length of idiosoma) 196–216; body width (width of opisthosomal plate C) 157–190; mutual distance of anterior coxal condyles 81–94 (mean 88.2±S.D. 3.46, n=14).

Dorsum (Fig. 7). Free margin of plate C rather wide, with radial striations faintly visible. Dorsal setae of opisthosoma not much different in length from each other, generally moderately long and rather thick, blunt-tipped except for *e* and h_2, with weak



Figs. 7–8. *Archidispus tonegawanus* Kurosa, sp. nov., phoretomorphic female; 7, dorsal aspect; 8, ventral aspect. Scale: 50 μm.

barbations; c_1, *d* and *f* arranged in two subparallel longitudinal lines; c_1 inserted well anterior to, and usually slightly shorter than c_2; ratio of mutual distance *d–d*/*f–f* 1.23–1.31; h_1 1.22–1.33 times as long as *f*. The order in length of dorsal opisthosomal setae: $h_2 \geqq e \geqq h_1 \geqq d \geqq f \geqq c_2 \geqq c_1$.

Venter (Figs. 6, 8). Apodemes well developed except for secondary transverse apodeme; apodeme 2 smoothly arcuate, sometimes conjointly forming a very obtuse, backward angle medially; secondary transverse apodeme weak, straight or slightly postcurved, often obliterated in lateral half of each side, almost or fully touching apodeme 2 medially; apodeme 3 pronounced; apodeme 4 slightly proclinate or procurved, laterally reaching cuticular thickening by coxal foramen III. Posterior genital sclerite comparatively large. Coxal setae simply setiform except for *4a*, *4b* and *4c*, faintly barbed except for *4a* and *4b*; *1a* inserted slightly anterior to the level of posteriormost point of camerostome, fairly apart from each other; *2a* close by, and slightly anterior to *2c*; *3a* extending far beyond apodeme 4; *3b* a short distance posterior to *3a*, considerably apart from poststernal apodeme; ratio of mutual distance *3b–3b*/*3a–3a* 2.19–2.48; *3c* roughly on the same level as *3b*; *4a* nearly equidistant from apodeme 4 and level of *4b*, distinctly thickened and (usually) slightly incurved in basal 2/5, the transition from thick to thin portion rather abrupt; *4b* distinctly thickened and weakly incurved in basal 1/3 or thereabouts, the transition from thick to thin portion gradual; *4c* somewhat thickened proximally, gradually attenuated distad. Pseudanal setae ps_1 and ps_3 short, weakly barbed; ps_3 a little longer than ps_1; ps_2 about 1/2 as long as ps_1.

Legs. Generally moderate in length and thickness. Leg I: femoral seta *d* foliate; tibiotarsus somewhat stout; solenidion φ_1 subclavate; ω_1 finger-shaped; φ_2 and ω_2 uniformly thin; the order in length of solenidia in some examples: ω_2 (15–19)$\geqq \varphi_2$ (13–16)$> \omega_1$ (10–13)$> \varphi_1$ (8–10). Legs II and III: tibial solenidion φ rodlike, 8–10 in length; tarsal solenidion ω finger-shaped, 7–10 in length; anterior and posterior claws subequal, medium in size; empodium also medium-sized. Leg IV (Fig. 4): tarsus and pretarsus moderately elongated; proximal portion of tarsus somewhat strongly widened from base to insertions of setae *pv′* and *tc′*; length ratio of pretarsus to tarsus 0.42–0.46; femoral and tibial setae *d* not much different in length from each other, nearly as long as tarsus, not fine distally, with bluntly pointed apex; tibial solenidion φ 11–12 in length; tibial seta *l′* a little longer than tibial *d*; tarsal seta *pl″* inserted close to base of *tc′*; claws small; empodium small, long-stalked.

RCC3 indices (n=6). Body length 216–233, body width 194–207. Length and mutual distance (in parentheses) of opisthosomal and coxal setae: c_1 37–39 (61–66), c_2 42–43 (146–158), *d* 49–57 (79–86), *e* 57–67 (167–178), *f* 41–45 (59–69), h_1 55–59 (37–42), h_2 62–74 (114–123), ps_1 23–31(11–13), ps_2 11–13(16–19), ps_3 31–35 (77–86), *1a* 31–43 (38–44), *1c* 34–38 (63–65), *2a* 29–40 (51–56), *2c* 31–32 (61–63), *3a* 38–42 (29–31), *3b* 46–51 (71–73), *3c* 40–44 (98–103), *4a* 27–30 (39–42), *4b* 45–55 (69–71), *4c* 51–58 (90–96). Length of legs (including some segments and some setae of leg IV): leg I 55–67, leg II 97–101, leg III 105–121, leg IV 156–169 (tarsus 50–53, pretarsus 21–24, Fe-*d* 48–51, Fe-*v′* 31–38, Ti-*d* 42–48, Ti-*l′* 56-64, Ta-*tc′* 82–94).

Non-phoretomorphic female, male and larva. Unknown.

Host. Specimens examined, 14 phoretomorphic females in total, were collected from the following carabid beetles belonging to two tribes:

Tribe Pterostichini — *Pterostichus* (*Poecilus*) *planicollis* (MOTSCHULSKY), *P.* (*Rhagadus*) *microcephalus* (MOTSCHULSKY), *P.* (*Lagarus*) *sulcitarsis* MORAWITZ, *P.* (*Melanius*) *rotundangulus* MORAWITZ, *P.* (*Eurythoracana*) *haptoderoides japanensis* (LUTSHNIK); Tribe Oodini — *Lachnocrepis* (*Eulachnocrepis*) *prolixa* (BATES).

The mites were found attached to the intersegmental membrane between pro- and mesothorax of the host beetle, with the exception of one example from the cervical membrane between head and prothorax of *L. prolixa*. The number of mites per host was 1 or 2. This species seems to be uncommon in the Kantô District in Honshu, Japan.

One of the paratype specimens was found in coexistence with five females of *A. kurosai* MAHUNKA et RACK and one female of an undescribed *Archidispus* species on an individual of *P. microcephalus*, but the attaching site of the latter six specimens was the cervical membrane, unlike *A. tonegawanus*.

Type material. Holotype ♀ (KUROSA 21107): Riv. Tone-gawa by Toride-shi, Ibaraki Pref., Honshu, Japan, ex *Pterostichus* (*Poecilus*) *planicollis* (MOTSCHULSKY), 2–IX–1971, K. KUROSA leg. Paratypes: [Honshu] 3♀♀, same data as holotype but ex *P. sulcitarsis*; 4♀♀, same data as holotype but ex *P. rotundangulus*; 3♀♀, same locality and collector as holotype, ex *P. microcephalus*, 17–IX–1972; 2♀♀, same data as the preceding but ex *P. h. japanensis*; 1♀, Tajima-ga-hara by Riv. Ara-kawa, Urawa-shi, Saitama Pref., ex *L. prolixa*, 1–IX–1971, K. KUROSA.

Type depository. The holotype is preserved in the collection of the National Science Museum, Tokyo (NSMT), Japan. The paratypes are now retained in my collection, but will be deposited in NSMT later.

Distribution. Japan (Honshu).

Etymology. The specific name refers to the Tone-gawa, on whose riverside all but one of the host beetles of the type material were collected.

Remarks. The phoretomorphic female of this species somewhat resembles that of *A. diploi* KUROSA, 1991, from Japan, but can be distinguished from the latter by many features, especially the following: body smaller; dorsal opisthosomal seta c_1 inserted well anterior to c_2; coxal seta *4b* much shorter and distinctly thickened proximally; legs not slender; seta *d* of femur IV nearly as long as tarsus IV; seta *d* of tibia IV bluntly pointed at apex. These two species are considered to be rather remote relatives.

要　約

黒佐和義：日本産ヒサシダニ科の研究XIII. 主としてナガゴミムシ族とゴモクムシ族のゴミムシに便乗する*Archidispus*属の2新種. —— ヒサシダニ科Scutacaridaeに属する*Archidispus*属のダニは，日本・ヨーロッパ・北米などから約50種が知られているが，若干種において雌成虫

に著しく体形の異なる2つの型 — 昆虫に付着する便乗型雌 (phoretomorphic female) と昆虫に付着する習性のない非便乗型雌 (non-phoretomorphic female) — を生じることが明らかにされており，これはこの属全体に共通の現象であろうと考えられる．わが国からは，これまでに，歩行虫類の成虫に付着した状態で見出された便乗型雌に基づいて，37種の*Archidispus*が報告されているが，なお，かなりの数の種が未記載のまま残されている．今回は主としてゴモクムシ族とナガゴミムシ族のゴミムシに見出される2新種を，*A. chujoi*および*A. tonegawanus*と命名し記載する．*A. chujoi*は*A. crassiradix* KUROSA, 1989と*A. kurosai* MAHUNKA et RACK, 1990 (=*A. similis* KUROSA, 1989) に多くの特徴で一致し，この2種および同じ論文で記載した*A. riparius*, *A. proximus*, *A. ohtanii*の3種に近縁のものと考えられるが，基節毛*4b*がかなり細く基部で太まることがまったくないことで容易に判別できる．*A. tonegawanus*は*A. diploi* KUROSA, 1991にやや似るが，体の大きさ，後体部背面の毛c_1の位置，基節毛*4b*の長さと形状，脚の太さ，第4脚の毛の長さと形状，そのほか多くの点で異なり，系統的にはあまり近縁でないと考えられる．

本論文は昨年6月に逝去された中條道夫先生から永年にわたり温かい励ましを頂いたものとして，先生の死を心から悼み捧げるものである．

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